The Elected Officials Guide to Earthquakes in the Central United States

Central United States Earthquake Consortium

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Introduction

Scientists or engineers alone cannot prevail over earthquakes. It will take all disciplines working together - from research scientists who attempt to predict earthquakes, to engineers who design structures that can withstand ground shaking, to rescue teams and emergency service personnel who work to save lives, to health practitioners who develop advance plans to treat the injured and the threats of disease to survivors. It will also take the talents of many people at the local level including public health officials, educators, voluntary organizations, and particularly elected officials.

Role of the Elected Official

The role of elected officials prior to an earthquake event is to prepare their community. This includes:

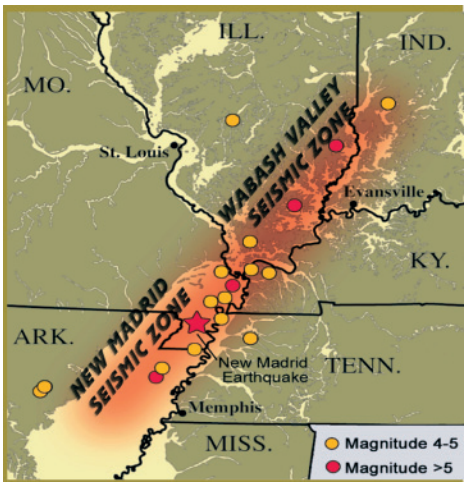
- Making sure that building codes are adequate to protect new structures;
- Encouraging building owners to retrofit older structures;
- Making sure that emergency services personnel have adequate training and equipment to respond to an earthquake;
- Advising residents to have an emergency plan; and,
- Many other activities that will protect the life, health and safety of the residents of the community.

Are Earthquakes a problem in the Central US?

Yes, in the sense that the central US is not ready for a moderate or larger event. Earthquakes by themselves are not a problem, the built environment is the problem. It is the earthquakes that occur in populated areas, and especially areas not accustomed to them such as the central US, that cause the problem.

Damaging earthquakes are inevitable in the central US even though the central US is far away from the geologically young and unstable seismic zones along the west coast in California, the Puget Sound, Washington-Oregon areas, and Alaska or the mid-Atlantic ridge in the Atlantic Ocean marking, respectively, that are the western and eastern boundaries of the North American plate. The most likely locations for an earthquake to occur in the central US include:

a) the New Madrid seismic zone where magnitude 6.5-6.8 earthquakes occurred near Memphis in 1843 and near St. Louis in 1895, and where four events of up to a magnitude 8 and scores of moderate-to-large-magnitude aftershocks occurred in the winter of 1811-1812, affecting a very large geographical area stretching from the Gulf of Mexico to the Canadian boarder; and



b) the Wabash Valley seismic zone, northeast of the New Madrid seismic zone, where damaging moderate earthquakes have occurred, affecting the states of Illinois, Indiana, Ohio, and Kentucky.

In recent decades, earth scientists have collected evidence showing that strong earthquakes in the central Mississippi Valley have occurred repeatedly in the geologic past. Small earthquakes (magnitude 3-3.9) happen frequently in the region.

Unfortunately, earthquakes come with no warning and no indication of their intensity. Today, the central United States is home to millions of people, including large population centers, such as St. Louis, Missouri, and Memphis, Tennessee. Today, a repeat of the earthquakes of 1811-12 would cause widespread loss of life and billions of dollars in property damage.

What can we expect from an earthquake in the Central US?

Consequences of moderate to large earthquakes in the central US are considered extremely high. Earthquakes in the central or eastern United States affect much larger areas than earthquakes of similar magnitude in the western United States, since the looser packed alluvial soils will carry shock waves much greater distances. For example, the San Francisco, California, earthquake of 1906 (magnitude 7.8) was felt 350 miles away in the middle of Nevada, whereas the New Madrid earthquake of December 1811 (magnitude 8.0) rang church bells in Boston, Massachusetts, 1,000 miles away. Differences in geology east and west of the Rocky Mountains cause this strong contrast.

The central US faces a high risk from earthquakes occurring in the New Madrid and Wabash Valley seismic zones due to the vulnerability of the built environment. Many communities contain un-reinforced masonry buildings and fragile infrastructure

much of which was not constructed in accordance with modern seismic codes and standards. Flawed or missing public policies on planning, siting, design, construction, and use have also caused the risk to increase over time. Now, each urban center within the central US has an inventory of non-engineered buildings and infrastructure that will likely fail because of lack of planning, siting, design, quality control, and construction practices. The value of the current inventory of buildings and infrastructure in the central US at risk from ground shaking and ground failure, the principal disaster agents of earthquakes, is in the trillions of dollars. The current perceived risk to existing buildings, infrastructure, and people in the central US is at a level where it is socially unacceptable. This means that there is a sufficiently high probability of loss to the elements of the built environment as a result of the occurrence. Physical and societal consequences of future earthquakes make it imperative that investments in mitigation and preparedness measures and regulations are urgently needed to reduce the losses to acceptable levels. This must be done now— before the catastrophic earthquake occurs.

The severity of an earthquake depends on four principal factors:

1) The magnitude, or "size," and depth of the earthquake
2) Its location and proximity to urban centers
3) The time of day and the season of the year when it strikes, and

Sustainable Communities

Sustainable development means meetings the needs of the present without compromising the ability of future generations to meet their own needs. This translates into sound economic development, strong building practices and wise use of natural resources. If governments encourage smart zoning, construction of hazard-resistant homes and use of renewable energy resources, citizens will likely pay less to rebuild public infrastructure when a disaster strikes. Also, when communities plan and build sustainably, fewer natural resources will be used because less rebuilding will be required after a natural disaster. Sustainable development includes land use planning, zoning, emergency management, and energy and economic development policies that meet current needs, while providing resources for the next generation of citizens.

4) The public policies for mitigation and preparedness that have been implemented as "works in progress" to reduce vulnerabilities in the built environment of each urban center and the corresponding unacceptable risks.

Only one of these factors—public policies—can be controlled; the remaining three cannot.

On the basis of what has happened in past, earthquakes in the central US and in areas of similar hazard and built environments throughout the world, along with damage estimates determined by preliminary loss modeling, it is well known that a catastrophic earthquake can leave an indelible mark for many years on individuals, businesses, communities, infrastructure, insurers, and the nation. Catastrophic earthquakes can adversely affect the environment, and overwhelm production facilities, distribution systems, and economic markets, jeopardizing the financial stability of businesses, insurers, communities, and the nation. Estimates of the economic losses from a catastrophic earthquake occurring today in the central US are in the range of $ 100-200 billion. The physical effects of such an earthquake would:

a) Damage, destroy, and/or disrupt the normal functions of government, schools, hospitals, essential and critical facilities, and business;
b) Disrupt local and regional infrastructure;
c) Leave tens of thousands dead, injured, homeless, or jobless;
d) Divert tourism and reduce the tax base;

e) Use up community resources planned for health care, education, and other social programs; and
f) Deplete insurance and financial resources.

The potential losses from future earthquakes of magnitude 6 or greater in the central U.S. are expected to be significant due to:

1) the high population density (Memphis, St. Louis, and many mid-sized towns);
2) the large number of structures that are not designed and constructed to withstand the effects of earthquakes;
3) the widely distributed unconsolidated sediment (soils), which is poor foundation material;
4) an aging infrastructure; and
5) the large area that would be affected by damaging ground motion (about 10 times larger than the area impacted by a California earthquake of comparable size)

What effect can you have on reducing the risk?

Strong earthquakes in the New Madrid seismic zone are certain to occur in the future. In contrast to the western United States, the causes and effects of earthquakes in the central and eastern United States are just beginning to be understood. Through better understanding of earthquake hazards and through public education, mitigation and support from you, the elected official, losses of life and property in future earthquakes can be reduced.

As an elected official, your role in addressing this hazard is critical. Support on issues directly tied to reducing a community's vulnerability lie within your control. Your actions can mean the difference between an earthquake with minimal impact and quick recovery or one that has a catastrophic impact with a long recovery period.

Components of a Successful Emergency Management

- √ Professionally trained staff
- √ Excellent working relationship among the legislative leadership and emergency management agency director and staff
- √ Sufficient funding
- √ Support for preparedness, response, recovery, and mitigation projects
- √ An emergency management agency that not only is integrally involved in land-use planning, economic development and housing decisions, but also is represented in different departments within government.

Recommendations

1. Familiarize yourself with mitigation programs within your area of representation. Effective mitigation programs can enhance the community's resilience to disasters and open the door to new ideas and collaboration with other communities, private industry and foundations.

2. Support programs that promote community-wide mitigation efforts. The frequency and cost of disasters necessitates a change in how emergency management policy is developed. Public officials can serve an important role in promoting partnerships and agency cooperation directed at mitigation.

3. Following a disaster, support legislation that encourages long term reconstruction goals – Successful long-term reconstruction results from effective interaction between elected officials and those involved in post-disaster recovery to overcome the short term obstacles that often thwart the achievement of those larger goals.

4. Encourage cross-discipline planning as a way of strengthening your community's resilience. Most communities have a comprehensive plan for the community's growth but few address the mitigation aspects outlined in plans for emergency preparedness.

5. Become familiar with the appropriate legislative and emergency management protocols for the level of government you represent. By law, a disaster declaration at the state or federal level activates temporary structures of governance that are overlaid atop normal operations at all levels.

Summary

The bottom line is elected officials play an important role in helping to reduce or eliminate the losses from earthquakes in the central US. Advanced planing, public awareness and strong mitigation programs are essential aspects of making a community better prepared. The success of implementing these and a host of other programs comes from the support of those who set policy.

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For additional information on the seismic hazard in the Central United States and what you can do to support the preparedness and mitigation efforts, contact:

Central United States Earthquake Consortium
2630 E. Holmes Road
Memphis, TN 38118
(901)-544-3570
cusec@cusec.org

FEMA Region IV
Earthquake Program
3003 Chamblee-Tucker Road
Atlanta, GA 30341
Phone: (770)-220-5426

FEMA Region V
Earthquake Program
536 S. Clark St., 6th Floor
Chicago, Illinois 60605
Phone: (312)-408-5324

FEMA Region VI
Earthquake Program
800 North Loop 288
Denton, Texas 76209
Phone: (940)-898-5136

FEMA Region VII
Earthquake Program
2323 Grand Blvd., Suite 900
Kansas City, Missouri 64108-2670
Phone: (816)-283-7005

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